

NASA Contractor Report 165843



NASA-CR-165843 19850021606

APPLICATION OF AN AERODYNAMIC ANALYSIS METHOD INCLUDING
ATTAINABLE THRUST ESTIMATES TO LOW SPEED LEADING-EDGE
FLAP DESIGN FOR SUPERSONIC CRUISE VEHICLES

Harry W. Carlson

LIBRARY COPY

or 13 1982

KENTRON INTERNATIONAL, INC.
Hampton Technical Center
an LTV company
Hampton, Virginia 23666

FOR EARLY DOMESTIC DISSEMINATION

Because of its significant early commercial potential, this information, which has been developed under a US Government program, is being disseminated within the United States in advance of general publication. This information may be duplicated and used by the recipient with the express limitation that it not be published. Release of this information to other domestic parties by the recipient shall be made subject to these limitations.

Foreign release may be made only with prior NASA approval and appropriate export licenses. This legend shall be marked on any reproduction of this information in whole or in part.

Review for general release March 31, 1985

Contract NAS1-16000 March 1982

National Aeronautics and Space Administration

Langley Research Center Hampton, Virginia 23665



SUMMARY

A study of low speed leading-edge flap design for supersonic cruise vehicles has been conducted. Wings with flaps were analyzed with the aid of a newly developed subsonic wing program which provides estimates of attainable leading-edge thrust. Results indicate that the thrust actually attainable can have a significant influence on the design and that the resultant flaps can be smaller and simpler than those resulting from more conventional approaches.

INTRODUCTION

The highly-swept low-aspect-ratio wings which permit high levels of aerodynamic efficiency at supersonic cruise conditions present serious problems in the low speed flight regime. One of these problems is the achievement of a sufficiently high lift coefficient to permit safe terminal area speed at an angle of attack which does not limit pilot visibility. The required lift coefficients can be generated at acceptable angles of attack through use of trailing-edge flaps. Unfortunately, for conventional supersonic cruise designs with wing-mounted engines and outboard ailerons, only a small portion of the trailing-edge span may be used for this purpose. Thus, large flap deflections are required to generate the additional lift, and drag penalties may be excessive. Properly designed leading-edge flaps can bring about significant improvements in the aerodynamic efficiency without reduction of the lift coefficient or increase in the associated angle of attack.

As reported in reference 1, significant progress has been made in improvement of the aerodynamic efficiency of leading- and trailing-edge flaps for supersonic cruise configurations. The conventional approach to leading-edge flap design has been to place segmented flaps on all of the wing area ahead of the front wing spar and to conduct wind-tunnel tests to determine optimum deflections.

A somewhat different approach to the leading-edge flap design problem is the subject of this paper. The concept is based on the observation that the primary purpose of the flap system is the achievement of an aerodynamic efficiency comparable to that which could be attained with full theoretical leading edge thrust. Accordingly, the new approach first attempts to assertain the local degree of achievement of leading edge thrust for the basic wing. Then, as required in a design by iteration process, local geometry changes in the form of leading edge flaps to compensate for the loss of thrust are introduced. Thus, for portions of the wing leading-edge where full theoretical thrust may be anticipated no flaps need be employed, and for the remainder of the leading-edge the flap chord and deflection angles may be limited to values just sufficient to restore the efficiency losses due to the failure to develop full leading-edge thrust.

The use of the computer program of reference 2 in the estimation of attainable leading-edge thrust and in the prediction of the aerodynamic characteristics of flap configurations is shown in comparisons with experimental data for a generic supersonic transport model. Further application of the computer program in an iterative design mode is illustrated in a sample problem - the definition of flap geometry for a typical supersonic transport in landing approach.

N151,991 N85-29918#

SYMBOLS

| AR | wing aspect ratio, b ² /S |
|---------------------------------|--|
| b | wing span |
| cA | section axial force coefficient |
| cN | section normal force coefficient |
| cŢ | section thrust coefficient |
| сЪ | section drag coefficient |
| cL | section lift coefficient |
| c_{A} | axial force coefficient |
| c_N | normal force coefficient |
| c_D | drag coefficient |
| c_{L} | lift coefficient |
| $c_{L_{\pmb{lpha}}}$ | lift curve slope, dC_L/d_{α} |
| L ₁ , L ₂ | designation of leading-edge flaps |
| τ ₁ , τ ₂ | designation of trailing-edge flaps |
| M | Mach number |
| у | lateral distance from wing centerline |
| S | Suction parameter, $\frac{C_L \tan (C_L/C_L) - C_D}{\alpha}$ |
| | C_{L} tan $(C_{L}/C_{L}) - C_{L}^{2}/(\pi AR)$ |
| S | wing reference area |
| R | Reynolds number |
| α | angle of attack |
| δ <u>L</u> | leading-edge flap deflection angle, positive for leading-edge down |
| δŢ | trailing-edge flap deflection angle, positive for trailing edge down |
| εμ | local angle of wing surface at the leading-edge relative to the free stream direction, includes basic wing camber and leading-edge flap deflection |

Subscripts

S

n measured in a plane perpendicular to the hinge line

measured in a plane parallel to the free stream

DISCUSSION

Assessment of Computer Program Applicability

The computer program of reference 2 which provides estimates of attainable thrust for wings at subsonic speeds is based on a planar solution of linearized theory equations. To study the applicability of the program to the present problem, comparisons of program results with previously unpublished data from tests conducted in the Langley Research Center V/STOL Tunnel have been made, and are shown in figure 1. The wind-tunnel model employed in these tests is particularly appropriate for this purpose. It represents a M = 2.7 cruise vehicle, but for simplicity only the wing and fuselage are represented in the model and the wing has no twist and camber. The low speed test conditions are M \approx .28 and R \approx 5.7 x 10^6 . The program has inherent limitations in the accuracy of flap planform modeling due to the wing element grid system employed. Although the spanwise position of the flap edges could only be approximated, the flap areas were matched by compensating changes in the flap chord.

In figure 1(a), the program results are compared with data for the basic flat wing. There is good agreement between the theory and experiment for the full range of angles of attack and lift coefficients. The axial force correlation is particularly significant since it shows an appreciable degree of achievement of leading-edge thrust. The normal force curve shows evidence of the presence of vortex lift, which is also accurately estimated by the program.

Figures 1(b) to 1(d) show similar correlations for a series of leading-edge flap deflections with the trailing-edge flap deflection fixed at 10°. Both trailing-edge flaps [see sketch in figure 1(a)] were set at 10°. The correlations are not as good as for the undeflected case, but there is still a reasonably good prediction of the lift-drag polar.

Figures 1(e) to 1(g) show correlations for a series of trailing-edge deflections with leading-edge flap deflections maintained at 30°. For this 30° leading-edge flap deflection, axial and normal force predictions are poor. There are, however, compensating effects so that the lift-drag relationships are given reasonably well in the $C_L = .4$ to $C_L = .8$ range. The program is seen to underestimate the amount of leading edge thrust and overestimate the normal force.

The ability of the program to assess trends may be examined with the aid of figure 2. Here data from figure 1 is shown as a function of leading edge and trailing edge deflection angles. The suction parameter s is defined as in reference 1 to be a measure of drag relative to the limits for fully attached and fully separated flow. These results indicate that, despite some inaccuracies in the absolute values predicted, the program may be used in a design process.

The Design Problem

The configuration of Table I has been taken as an example for application of various flap designs (see reference 3 for an explanation of the format used for the geometric description given in Table I). This is a wing-fuselage-vertical tail configuration with a twisted and cambered wing designed for $C_L = 0.10$ at M = 2.7. Landing approach design conditions have been chosen as:

$$M = .25$$

 $R = 160 \times 10^{6}$
 $C_{L} = .55$
 $\alpha = 8^{\circ}$

Two trailing-edge flaps on either side of the airplane (between the fuselage and the inboard engine, and between the inboard and the outboard engine) are fixed in planform but may be deflected as necessary (the same angle for both). It is assumed that trailing-edge devices for the remainder of the wing will be employed as ailerons for roll control and will be unavailable for use in generating lift.

Conventional Design Approach

As a base-line reference, conventional leading-edge flaps similar to those treated in reference 1 have been analyzed. In that reference the test results indicated that a uniform deflection along the entire leading-edge performed as well as, if not better than, any other deflection schedule included in the tests. Accordingly, the conventional flap analysis will be simplified by the assumption of a constant deflection over the whole of the leading-edge. Results of the analysis are summarized in figure 3. The simplification of one deflection angle for the trailing-edge flaps and one deflection angle for the leading-edge flaps permits the program results to be presented in the form of a contour map. Suction parameters at $C_L = .55$ and angles of attack corresponding to $C_L = .55$ are shown by the contour lines as a function of the leading- and trailing-edge deflection angles.

According to the map, the optimum performance of the flap configuration subject to the limitation of $\alpha \le 8^\circ$ occurs for a trailing-edge flap deflection of about 20° and a leading-edge deflection of about 13° (when measured normal to the hinge line this angle is about 34° for the inboard wing panel and about 22° for the outer panel). The indicated suction parameter is about 0.70. Based on the previous correlations of experiment and theory, it is likely that a somehwat higher suction parameter could be realized (perhaps as high as 0.78). However, it also is likely that a larger trailing-edge flap deflection would be required to generate a lift coefficient of .55 at $\alpha=8^\circ$. This contour map also indicates that misleading results could be obtained if the variation of suction parameter with leading-edge deflection angle were examined at a trailing-edge flap deflection angle (say $\delta_T=0^\circ$) other than that for optimum performance.

Design Approach Based On Attainable Thrust

To initiate the new design for the present configuration, the program of reference 2 was used to estimate the spanwise distribution of forces on the wing basic camber surface as shown in figure 4. For the design lift coefficient of

0.55, full theoretical thrust is estimated for the inboard 20 percent of the wing semispan. The loss in thrust beyond that point is felt as an increase in normal force according to the Polhamus Suction Analogy.

At the design conditions, the inboard portion of the wing leading-edge is more likely to perform as it does at 8° angle of attack than as it does at a lift coefficient of 0.55. The additional lift generated by the trailing-edge flaps can have little influence on the leading-edge. Figure 5 shows program data for the 8° angle of attack design condition. Here full leading-edge thrust is seen to extend to 25 percent or more of the wing semispan.

Based on the preceeding information, a leading-edge flap design was developed and subjected to program evaluation. The results are shown on the suction parameter contour map of figure 6. An inset sketch shows the selected flap system planform. The flap chord increases linearly from 0 percent of the local chord at y/b/2 = .25 to 36 percent of the local chord at the leading-edge break. From there it decreases linearly to 30 percent of the chord of the wing tip. Both flap segments L_1 and L_2 are simply hinged and are deflected to the same angle relative to the freestream direction.

The program results presented in figure 6 show a modest gain in suction parameter over the reference design (s = 0.74 compared to 0.70), and the new design is simpler and could probably be constructed with less weight penalty. The leading-edge flap deflection for optimum performance is quite large, about 35° (64° and 50° respectively for the inboard and outboard panel when measured normal to the hinge line). It is quite possible that the true optimum condition would be reached at a considerably smaller deflection angle. The program results do indicate no great sensitivity of the suction parameter to leading-edge deflection when the $\alpha \leq 8^\circ$ restriction is imposed. As with the more conventional design previously discussed, it is likely that the actual suction parameter would be somewhat higher and that the required trailing-edge flap deflection would be greater.

The design conditions for this example were a lift coefficient of .55, a Mach number of .25, and a full scale Reynolds number of 160 X 10⁶. For another set of design conditions it would be necessary to redefine the flap geometry and prepare a new suction parameter contour map. In general, a lower design lift coefficient would permit a more outboard origin of the flap and smaller flap deflection angles, and a higher design lift coefficient would have the opposite effect. Lower design Mach numbers and higher design Reynolds numbers favor the development of thrust and thus would lead to smaller leading-edge flap systems.

The dependence of attainable thrust on both Mach number and Reynolds number complicates the problem of extrapolation of tunnel test results to full scale conditions. For example, if tests of this flap system were made at a Mach number of .2 and a Reynolds number of 3.5 \times 10 6 , an extrapolation to full scale design conditions would indicate no appreciable improvement in aerodynamic performance. A discussion of extrapolation to account for leading-edge thrust effects is given in reference 2.

Program aerodynamic forces for the partial span leading-edge flap arrangement are shown in figure 7. The peculiar nature of the axial force curves (the no thrust and full thrust curves do not meet) is due to the distinct regions of the wing leading-edge. Inboard of the flaps, the angle of attack for zero thrust is between -2 and -3 degrees. On the flaps, the angle of attack for zero thrust is between 6 and 8 degrees. Thus, some thrust is produced at all angles of attack.

Note also that little or no vortex lift is developed at the design condition, as should be the case if the flap serves to maintain attached flow.

The spanwise distribution of forces on the wing with partial span leading-edge flaps at the design condition is shown in figure 8. The most obvious changes from the basic camber surface distribution (figures 4 and 5) are in the axial force distribution where the drag penalties of the deflected trailing-edge flaps appear to dominate. However, there is also a large region of the wing outboard of the mid-semispan where a significant thrusting force has been realized. This is due to the leading-edge flap operating in the large upwash field generated by the forward part of the wing. This benefit is similar to that which could be achieved were it possible for the full theoretical thrust to be developed.

The partial span leading-edge flap design based on attainable thrust considerations employs a constant deflection angle for the entire length of the flap. Figure 9 was prepared as a means of judging possible improvements with other deflection schedules. Section drag due-to-lift factors have been plotted as a function of the leading-edge flap deflection. To eliminate the intermingling of curves that otherwise would occur, the drag due-to-lift factors shown are increments relative to the zero leading-edge deflection values. For the outer half of the wing semispan, minimum section drag due-to-lift factors generally occur in the 35° to 40° deflection range. This data thus indicates that other deflection schedules would offer little or no benefit over the constant deflection angle. The linearly increasing flap chord probably results in an effective leading-edge camber which matches the increasing upwash field. As additional evidence, several other deflection schedules were evaluated by use of the program. None of these offered any improvements.

Comparison of Flap Designs

In addition to the basic camber surface alone and the two flap designs just discussed, several other variations of these designs were evaluated. The results are depicted in figure 10. Suction parameters at a $\rm C_L$ of .55 are shown for eight configurations. For the flat wing, an angle of attack of 13.1° was required to generate the design lift coefficient. For this wing with no camber and no flaps, the suction parameter was 0.49. The wing with a camber surface designed for supersonic cruise, had a significant improvement in suction parameter to 0.59 and achieved the design lift coefficient at an angle of attack of 10.5°.

The remainder of the configurations of figure 10 employed trailing-edge flaps which permitted the design goals of C_L = .55 and α = 8° to be achieved simultaneously. The conventional design approach discussed previously, yielded a further improvement in suction parameter to almost 0.70. The next configuration differed from the conventional design only in the elimination of the inboard leading-edge flap. It is interesting to note that the present analysis shows a slight improvement in suction factor. The fifth configuration is the result of the design approach based on attainable thrust. This design, already discussed in detail, has a program predicted suction factor of 0.74.

The last three configurations employ leading-edge flaps with parabolic streamwise curvature. The deflection is proportional to the square of the distance forward of the hinge line. Data for the sixth configuration indicates a further substantial increase in suction parameter to a little more than .80. Actual

benefits of this more sophisticated system would depend on the weight penalties of the more complicated actuator system. Because of the strong influence of the outer flap panel in reduction of the overall drag (refer to figure 9 for example), one configuration with a double area outboard flap was examined. As shown, this produced a negligible improvement. The final configuration was included to indicate the penalties being paid for the severe restrictions imposed on the span of the two trailing-edge flaps. Program results indicates that if the trailing-edge flap could extend over the entire wing span, a suction parameter of 0.86 could be achieved. It was somewhat surprising that a larger difference was not indicated.

Based on correlations of computer program results with experimental data for a wing-body of similar planform (see figure 2) it is anticipated that somehwat better suction parameters than shown in figure 10 could be achieved in practice.

CONCLUSIONS

A study of low speed leading-edge flap design for supersonic cruise vehicles, based on a recently developed computer program with attainable thrust estimates, indicates the following conclusions:

- (1) Leading-edge flaps are not required and, in fact, are undesirable at span stations where full leading-edge thrust is attainable. For the example treated this includes the inboard 25 percent of the wing semispan.
- (2) Outboard of the station where thrust loss begins, a linearly increasing flap chord appears to produce the effect of increasing camber and eliminate the need for flap segmenting. A simple design with a constant deflection about the hinge line is thus acceptable.
- (3) Leading-edge flaps with camber surface curvature are preferable from an aerodynamic standpoint but do, of course, create other design problems.

REFERENCES

- 1. Coe, Paul L.; Thomas, James L.; Huffman, Jarrett K.; Weston, Robert P.; Schoonover, Ward E. Jr.; and Gentry, Carl L. Jr.: Overview of the Langley Subsonic Research Effort on SCR Configurations. Supersonic Cruise Research '79, Part 1. Proceedings of a conference held at Langley Research Center, Hampton, Virginia, November 13-16, 1979. NASA Conference Publication 2108. Paper 1.
- 2. Carlson, Harry W.; and Walkley, Kenneth B.: A Computer Program for Wing Subsonic Aerodynamic Performance Estimates Including Attainable Thrust and Vortex Lift Effects. NASA CR-3515, 1982.
- 3. Craidon, Charlotte B.: Description of a Digital Computer Program for Airplane Configuration Plots. NASA TM X-2074, 1970.

Table I. - Wind Tunnel Model Definition (inches).

| 1335-5335-465 6-3-309 0-000 -500 1-CCO 1-500 Z-500 5.000 10.CCO 15.0CO 20.C00 30.C0C 40-000 50.000 60.000 70.6CC 7*.CCO 80.CCO 85.000 90.000 95.CO0100.000 XAF 20 20.858 0.C0C 7.CCP 65.9CE 90.CCO 85.000 90.000 95.CO0100.000 XAF 20 22.889 0-20 6-450 63.865 24.919 1.240 5.860 61.821 90.000 28.710 2.400 4.801 57.999 33.041 3.72C 3.675 93.647 37.103 4.960 2.755 49.561 41.104 4.200 1.999 45.474 41.104 4.200 1.999 45.474 41.104 7.200 1.999 45.474 41.103 7.07C 1.504 42.600 47.976 0.280 1.132 29.618 90.600 22.102 9.34C 0.774 34.836 90.600 30.600 1.32 29.618 30.613 1.32 20.619 19.309 90.600 30.600 1.32 20.619 19.309 90.600 30.600 1.32 20.619 19.309 90.600 30.600 10.600 1.11 12.162 30.971 90.40C 0.123 10.589 37.053 16.12C 0.173 16.646 37.9810 18.001 0.117 12.162 90.000 37.292 22.32C 0.118 8.47C 97.810 18.001 0.117 12.162 90.000 37.292 22.32C 0.118 8.47C 97.810 18.001 0.117 12.162 90.000 37.292 22.32C 0.118 8.47C 97.800 10.355 5.140 5.915 -6.236 -6.530 -6.601 -7.C45 -7.258 -7.42C 72 12.2 0.000 -0.009 -0.019 -0.027 -0.045 -1.337 -4.25 -8.01 -1.233 -2.357 72 12.12 0.000 -0.009 -0.019 -0.027 -0.045 -1.337 -4.25 -8.01 -1.233 -2.3166 72 12.2 0.000 -0.009 -0.019 -0.027 -0.045 -1.337 -4.25 -8.01 -1.233 -2.3166 72 12.2 0.000 -0.009 -0.019 -0.027 -0.045 -1.37 -4.25 -8.01 -1.233 -2.3166 72 12.2 0.000 -0.009 -0.019 -0.027 -0.045 -1.377 -4.277 -8.93 -1.316 72 72 12.2 0.000 -0.009 -0.019 -0.027 -0.045 -1.377 -4.277 -8.093 -1.368 -1.092 72 12.2 0.000 -0.009 -0.019 -0.027 -0.045 -1.377 -4.279 -0.005 -1.009 72 72 12.2 0.000 -0.009 -0.019 -0.027 -0.045 -1.377 -4.279 -3.005 -1.009 72 72 72 72 72 72 72 72 72 72 72 72 72 | SCR LO | W-SPEFD | GENEPI | C HOUEL | [6/19/ | BOT ABE | | | | 10 | |
|--|--------|---------|-------------------------|---------|-----------------|-----------|-------------|---------|---------|--------|----------|
| 0.000500 1.cc0 1.500 2.500 5.000 10.cc0 15.cc0 20.c00 30.cc0 XAF 16 40.000 50.000 67.c00 70.cc0 77.cc0 80.cc0 85.000 90.000 95.000100.000 XAF 16 40.000 50.000 77.c00 77.cc0 85.000 80.cc0 85.000 90.000 95.000100.000 XAF 16 22.889 0.006 77.c00 80.cc0 85.000 90.000 95.000100.000 XAF 16 22.889 0.006 77.c00 80.cc0 85.000 90.000 95.000100.000 XAF 16 22.889 0.006 77.c00 85.000 90.000 95.000100.000 XAF 16 22.889 0.006 77.c00 85.000 90.000 95.000100.000 XAF 16 90.000 90.000 95.000 95.000100.000 XAF 16 90.000 90.000 95.000 95.000100.000 YAF 16 90.000 95.0 | | | . ร. วักฉ | £0 £0_ | | 7 | | _ | • | | 0555 |
| 20.388 0.000 70.600 66.000 70.600 73.000 85.000 90.000 95.000100.000 VAR 20 22.889 0.600 6.005 7.099 65.000 90.000 95.000100.000 VAR 20 22.899 0.600 6.458 63.865 | | | · · · · · · · · · · · · | • | 3 800 | E 000 | 10 000 | 18 000 | 20 000 | 20 000 | 4773 |
| 20.858 0.600 7.609 65.908 22.8878 0.620 6.458 63.865 24.919 1.240 5.800 61.821 28.718 2.400 4.801 77.998 37.103 3.720 3.673 33.647 37.103 4.760 2.755 49.561 41.164 6.200 1.999 45.474 4.013 7.070 1.854 42.600 47.976 8.280 1.134 29.618 92.102 9.540 0.774 34.836 92.102 9.540 0.774 34.836 92.102 9.540 0.774 34.836 92.102 9.540 0.774 34.836 92.102 9.540 0.774 34.836 92.102 9.540 0.774 34.836 92.102 9.540 0.774 34.836 92.102 9.540 0.774 34.836 92.102 9.540 0.777 30.509 61.273 12.340 0.227 26.451 69.984 15.000 0.199 19.309 73.653 16.120 0.137 12.162 99.984 15.000 0.199 19.309 79.910 18.000 0.117 12.162 90.901 18.000 0.117 12.162 91.988 24.800 0.017 12.162 91.988 24.800 0.017 0.200 -0.000 -0.017 12.162 91.998 24.800 0.019 19.309 91.200 0.000 -0.000 -0.019 -0.027 -0.045 -1.37 -4.25 -8.01 -1.233 -2.166 17 2.1 93.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.01 -1.233 -2.166 17 2.1 93.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.01 -1.233 -2.166 17 2.1 93.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.01 -1.233 -2.166 17 2.1 93.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.01 -1.233 -2.166 17 2.1 93.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.01 -1.233 -2.166 17 2.1 93.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.01 -1.233 -2.166 17 2.1 93.000 -0.000 -0.019 -0.07 -0.05 -0.17 -0.05 -1.37 -1.25 -8.20 -6.037 -6.012 17 2.2 90.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.00 -6.06 -6.236 17 2.1 92.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.00 -6.06 -6.236 17 2.1 93.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.00 -6.26 -6.437 -6.012 17 2.2 90.000 -0.000 -0.019 -0.07 -0.05 -1.37 -4.25 -8.00 -6.26 -6.437 -6.012 17 2.2 90.000 -0.000 -0.019 -0.020 -0.030 - | | | 46. 000 | 70.500 | 75.000 | 20070 | 10.000 | 19.000 | 20.00 | 33.000 | XAF 10 |
| 22.889 | | | | | 77. ÇÇU | . 80. 600 | 83.000 | _40.000 | 42.0001 | 00.000 | |
| 24-919 1-24-0 5-880 61-821 28-718 2.400 4.601 77-998 33-041 3.72C 3-675 23-647 37-103 4.960 2.755 40-561 41-104 8.200 1.909 45.474 44-013 7.07C 1.584 42-606 44-013 7.07C 1.584 42-606 44-013 7.07C 1.584 42-606 52-102 9.54C 0.774 34-836 55-760 10-602 0.477 30-569 61-273 12-340 0.227 76-431 69-904 15-000 C.199 19-300 79-810 18-00C C.199 19-300 79-810 18-00C 0.199 19-300 79-810 18-00C 0.199 19-300 79-810 18-00C 0.117 12-162 79-810 18-00C 0.123 16-646 79-810 18-00C 0.123 10-569 67-292 22-32C 0.118 8-47C 01-578 48-800 0.079 6-33C 0-00C -0014 -0.020 -0.03C -0.040 -1.32 -4.28837 -1.312 -2.357 VDRCT2-1.000 0-009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.37 -4.25801 -1.233 -2.166 YZ 2-1.000 0-000 -0.009 -0.019 -0.07 -0.045 -1.30 -1.304 -1.805 -1.304 -1.805 -1.306 -1.3 | | | - | | | | - | | | | _ |
| 28-710 2-400 4-801 17.496 33-041 3-72C 3-675 23-647 37-103 4-900 2-755 49-561 41-164 6-200 1-994 54-74 44-013 7.07C 1-584 42-600 47-976 8-280 1-334 79-618 52-102 9-54C 0-774 34-836 50-765 10-62C 0-477 30-569 79-801 18-000 1-199 19-300 73-053 16-12C 0-113 16-646 79-810 18-000 1-197 12-162 79-810 18-001 0-117 12-162 79-810 18-001 0-117 12-162 79-810 18-001 0-117 12-162 79-810 18-001 0-117 12-162 79-800 18-001 0-11 | | | | | | | _ | | | | |
| 37-103 4-960 2-755 49-561 WORG 6 | | | | | _ | | | | | | WORE 3 |
| 17.103 | | | | | | _ | | | | | WTRGT1- |
| 10 | 33.041 | | | | | _ | | | | | WORG 5 |
| 10 | 37.103 | 4.960 | 2.755 | 49.561 | _ | | | | | | WORG 6 |
| 10 | 41.164 | 5.200 | 1.999 | 45.474 | | _ | | | | | WOPG 7 |
| 10 | 44.013 | 7.07C | 1.584 | 42.606 | | _ | | | | | WORGT1- |
| 56.760 10.662 0.477 30.569 | 47.976 | 8.280 | 1.134 | 28.618 | | | | | | | WORG 8 |
| 56.760 10.662 0.477 30.569 61.273 12.340 0.257 26.431 | 52.102 | 9.540 | 0.774 | 34.836 | • | - | | | | | WORGT2- |
| 61.273 12.340 0.227 26.431 | 56.760 | 10.962 | 0.477 | 30.569 | - | | | | | | |
| ## 426 13.606 | | | | | | | | | | | |
| 69.984 15.000 C.199 10.309 W0RGT3-73.653 16.12C 0.117 12.162 W0RC 13 79.810 18.00C 0.117 12.162 W0RC 13 79.810 18.00C 0.117 12.162 W0RGT4-82.997 19.84C 0.123 10.569 W0RGT4-82.997 19.84C 0.122 10.2 | | | | | | • | | | | | |
| 73.653 16.12C 0.133 16.646 WORE 13 79.810 18.001 0.117 12.162 WORE 13 82.997 19.84C C.123 30.589 WORE 13 87.292 22.32C 0.118 8.47C WORE 13 87.292 22.32C 0.118 8.47C WORE 13 91.588 24.80C C.079 6.35C WORE 14 -3.40O -4.355 -5.194 -5.015 -6.236 -6.530 -6.801 -7.045 -7.258 -7.429 TZ 1.2 0.60C -0.014 -0.92O -0.03C -0.049 -0.132 -0.428 -0.837 -1.312 -2.357 TZ 1.1 0.60C -0.019 -0.019 -0.027 -0.045 -1.37 -0.425 -0.801 -1.233 -2.166 TZ 2.1 -3.40O -4.355 -5.194 -5.915 -6.236 -6.530 -6.801 -7.045 -7.258 -7.429 TZ 1.2 0.60C -0.009 -0.019 -0.027 -0.045 -1.37 -0.425 -0.801 -1.233 -2.166 TZ 2.1 -3.092 -3.642 -4.665 -5.333 -5.652 -5.930 -6.189 -6.426 -6.637 -6.812 TZ 2.2 0.00C -0.05 -0.011 -0.016 -0.024 -0.124 -3.94 -7.42 -1.136 -1.978 TZ 3.1 -2.9107 -3.569 -4.249 -4.853 -5.130 -5.39C -5.634 -7.860 -6.064 -6.236 TZ 3.2 0.00C -0.04 -0.09 -0.02 -0.02 -0.02 -0.027 -0.175 -3.79 -6.605 -1.074 TZ 3.1 -2.222 -2.835 -3.395 -3.907 -4.147 -4.377 -4.977 -4.864 -4.997 -5.165 TZ-T1. 0.0000 -0.02 -0.04 -0.00 -0.02 -0.027 -0.175 -3.79 -0.605 -1.004 TZ 5.1 0.000 -0.01 -0.09 -0.14 -0.23 -0.14 -0.69 -0.206 -3.62 -7.07 TZ 6.1 0.000 -0.01 -0.09 -0.14 -0.23 -0.14 -0.09 -0.06 -3.62 -7.07 TZ 6.1 0.000 -0.01 -0.09 -0.14 -0.23 -0.14 -0.09 -0.06 -3.62 -7.07 TZ 6.1 0.000 -0.01 -0.09 -0.14 -0.23 -0.05 -0.05 -0.06 -3.62 -7.07 TZ 6.1 0.000 -0.01 -0.09 -0.14 -0.23 -0.05 -0.05 -0.06 -3.62 -7.07 TZ 6.2 0.000 -0.01 -0.09 -0.14 -0.02 -0.05 -0.05 -0.00 -3.02 -7.07 TZ 6.2 0.000 -0.01 -0.00 -0.01 -0.00 -0.01 -0.00 -0 | | | | | | _ | - | | | | |
| 79.810 18.001 0.117 12.162 82.997 19.840 | | | | | | | | | | | _ |
| 70,810 18,001 0.117 12.162 | | | | | - | | - | | | | |
| 82.997 19.84C | | | | | | | | | | | |
| 87.292 22.32C | | | | | | | - | | | | |
| 91.588 24.80C | | | | | | | | | | | |
| 0.066016020036040132428837 -1.312 -2.357 TZ 1.1 -3.400 -4.355 -5.194 -5.915 -6.236 -6.530 -6.801 -7.045 -7.258 -7.429 TZ 1.2 0.0000009019027045137 -4.258801 -1.233 -2.166 TZ 2.1 -3.092 -3.642 -4.665 -5.323 -5.652 -5.930 -6.189 -6.426 -6.637 -6.812 TZ 2.2 0.000005011014034124394742 -1.136 -1.978 TZ 3.1 -2.907 -3.569 -4.249 -4.853 -5.130 -5.300 -5.634 -5.860 -6.064 -6.236 TZ 3.2 0.000004009012023002296577893 -1.563 TZ -TL -2.222 -2.835 -3.937 -3.907 -4.147 -4.377 -4.597 -4.805 -4.997 -5.165 TZ-TL -0.000 .002 .004 .006 .002027175375605 -1.004 TZ 5.1 -1.594 -2.052 -2.494 -2.916 -3.121 -3.323 -3.519 -3.709 -3.888 -4.092 TZ 5.2 0.000 .001 .009 .014 .023 .014 -0.069206362707 TZ 6.1 -1.064 -1.416 -1.768 -2.117 -2.292 -2.468 -2.643 -2.214 -2.981 -3.137 TZ 6.2 0.000 .005 .001 .016 .027 .054 .015062161392 TZ 7.1 -6.44909 -1.184 -1.473 -1.622 -1.774 -1.629 -2.002234 -2.380 TZ 7.2 0.000 .008 .015 .024 .039 .050 .047 00.69237 TZ-TL434645883 -1.134 -1.227 -1.403 -1.542 -1.683 -1.825 -1.961 TZ-TL. 0.000 .008 .015 .024 .039 .050 .047 00.69237 TZ-TL. 0.000 .008 .015 .024 .039 .050 .047 00.69237 TZ-TL. 0.000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TL. 0.000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TL. 0.000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TL. 0.000 .006 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TL. 0.000 .006 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TL. 0.000 .006 .016 .024 .041 .075 .109 .113 .130 .095 TZ-TM. 0.000 .006 .017 .025 .024 .041 .075 .109 .113 .130 .095 TZ-TM. 0.000 .006 .016 .024 .041 .075 .109 .109 .113 .130 .095 TZ-TM. 0.000 .006 .016 .024 .041 .075 .109 .009 .013 .035 .007 TZ-TL. 0.000 .006 .016 .024 .041 .075 .109 .009 .013 .035 .007 TZ-TL. 0.000 .006 .016 .024 .041 .075 .109 .009 .009 .009 .000 .005 TZ-TM. 0.000 .001 .002 .003 .005 .009 .009 .009 .001 .001 TZ-TL. 0.000 .001 .002 .003 .005 .009 .009 .009 .009 .001 .001 TZ-TL. 0.000 .00 | | | | | | | | | | | WORG 17 |
| -3.400 -4.355 -5.194 -5.915 -6.236 -6.530 -6.01 -7.045 -7.258 -7.429 TZ 1.2 0.000 -0009 -0019 -0027 -0045 -137 -425 -8011 -1.233 -2.166 TZ 2.1 -3.092 -3.942 -4.665 -5.353 -5.652 -5.930 -6.189 -6.426 -6.637 -6.012 TZ 2.2 0.000 -005 -0.11 -0.16 -0.24 -1.24 -3.94 -7.42 -1.136 -1.978 TZ 3.1 -2.907 -3.569 -4.249 -4.853 -5.130 -5.390 -5.634 -5.860 -6.064 -6.236 TZ 3.2 0.000 -0.064 -0.09 -8.13 -0.23 -0.82 -2.296 -7.77 -8.893 -1.543 TZ-T1 -2.222 -2.835 -3.395 -3.907 -4.147 -4.377 -4.997 -4.805 -4.997 -5.165 TZ-T1 0.000 -0.02 -0.04 -0.06 -0.02 -0.02 -0.027 -1.75 -3.75 -6.05 -1.094 TZ 5.1 0.000 -0.02 -0.04 -2.916 -3.121 -3.323 -3.519 -3.709 -3.888 -4.052 TZ 5.2 0.000 -0.05 -0.09 -0.14 -0.23 -0.14 -0.09 -2.06 -3.62 -7.07 TZ 6.1 -1.584 -2.052 -2.494 -2.916 -3.121 -2.292 -2.468 -2.643 -2.814 -2.981 -3.137 TZ 6.2 0.000 -0.05 -0.01 -0.04 -0.02 -0.05 -0.054 -0.05 -0.054 -0.05 -0.054 -0.054 -0.05 -0.054 -0.054 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.052 -0.054 -0.003 -0.052 -0.054 -0.052 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 -0.054 -0.055 | | | | | | | | | | | WDP GT4- |
| 0.600009019027045137425801 -1.233 -2.166 TZ 2.1 -3.092 -3.642 -4.655 -3.23 -5.652 -5.930 -6.189 -6.426 -6.637 -6.612 TZ 2.2 -0.000005011016024124394 -7.42 -1.136 -1.978 TZ 3.1 -2.907 -3.569 -4.249 -4.853 -5.130 -5.390 -5.634 -5.860 -6.004 -0.236 TZ 3.2 0.000004009012023002296577893 -1.563 TZ-TI. 0.000 .002 .004 .006 .002027175375605 -1.094 TZ 5.1 0.000 .002 .004 .006 .002027175375605 -1.094 TZ 5.1 -1.594 -2.052 -2.494 -2.916 -3.121 -3.323 -3.519 -3.709 -3.888 -4.052 TZ 5.2 0.000 .005 .009 .014 .023 .014089206362707 TZ 6.1 0.000 .005 .001 .016 .027 .054 .015062161392 TZ 7.1644909 -1.184 -1.473 -1.622 -1.774 -1.929 -2.082 -2.234 -2.980 TZ 7.2 0.000 .005 .011 .016 .027 .054 .015062161392 TZ 7.1434645883 -1.134 -1.227 -1.603 -1.542 -1.683 -1.825 -1.961 TZ-TI. 0.600 .008 .017 .026 .033 .007 .009 .073 .035071 TZ 8.1 0.600 .008 .017 .026 .043 .077 .090 .073 .035071 TZ 8.1 0.600 .008 .016 .024 .039 .077 .090 .073 .035071 TZ 8.1 0.600 .008 .016 .024 .034 .077 .090 .073 .035071 TZ 8.1 0.600 .008 .016 .024 .034 .077 .090 .073 .035071 TZ 8.1 0.000 .006 .016 .024 .034 .077 .090 .073 .035071 TZ 8.1 0.000 .006 .016 .024 .004 .007 .1130 -1.255 -1.381 -1.500 TZ-TZ 0.000 .006 .016 .024 .004 .079 .116 .131 .130 .095 TZ-TTZ 0.006 .006 .016 .024 .004 .007 .116 .131 .130 .095 TZ-TTZ 0.006 .006 .016 .024 .004 .007 .117 .140 .149 .129 TZ-TZ 0.000 .006 .016 .024 .004 .007 .117 .140 .149 .129 TZ-TZ 0.000 .006 .016 .024 .004 .007 .117 .130 .1255 -1.381 -1.500 TZ-TZ 0.000 .006 .016 .024 .004 .007 .117 .130 .130 .095 TZ-TTZ 0.000 .006 .016 .024 .004 .007 .117 .130 .125 -1.045 -1.155 TZ-TZ 0.000 .006 .016 .024 .004 .007 .006 .007 .007 .007 .007 .007 .007 | | | 020 | 030 | 040 | 132 | 428 | 637 | -1.312 | -2.357 | TZ 1.1 |
| -3.092 -3.642 -4.665 -5.353 -5.652 -5.930 -6.189 -6.426 -6.637 -6.812 TZ 2.2 0.000 -0.05 -0.11 -0.16 -0.03 -5.034 -5.860 -6.064 -0.236 TZ 3.2 0.000 -0.04 -0.09 -0.12 -0.023 -0.82 -2.96 -5.577 -8.93 -1.563 TZ -1.2 0.000 -0.04 -0.09 -0.12 -0.023 -0.82 -2.96 -5.577 -8.93 -1.563 TZ -11.2 0.000 -0.04 -0.09 -0.12 -0.023 -0.82 -2.96 -5.577 -8.93 -1.563 TZ -11.2 0.000 -0.02 .0.04 .0.06 .0.02 -0.027 -1.75 -3.70 -0.65 -1.094 TZ 5.1 1.594 -2.052 -2.494 -2.916 -3.121 -3.323 -3.519 -3.709 -3.888 -4.052 T7 5.2 0.000 .001 .009 .014 .023 .014 -0.069 -2.06 -3.62 -0.707 TZ 6.1 -1.064 -1.418 -1.768 -2.117 -2.292 -2.468 -2.463 -2.414 -2.981 -3.137 TZ 6.2 0.000 .005 .011 .016 .027 .054 .015 -0.062 -1.61 .392 TZ 7.1 -0.444 -0.09 -1.184 -1.473 -1.622 -1.774 -1.929 -2.002 -2.234 -2.380 TZ 7.2 0.008 .015 .024 .039 .060 .047 .0 -0.08 .015 .024 .039 .060 .047 .0 -0.069 .017 .026 .043 .077 .090 .073 .035 -0.71 TZ 6.1 -3.43 -6.49 .088 -1.134 -1.267 -1.603 -1.552 -1.683 -1.825 -1.961 TZ-T1.2 0.000 .008 .017 .026 .043 .077 .090 .073 .035 -0.71 TZ 6.1 -2.10 -3.37 -5.62 -7.74 -6.89 -1.007 -1.130 -1.255 -1.381 -1.506 TZ 8.2 0.000 .008 .016 .024 .040 .079 .116 .131 .130 .095 TZ-T1.2 0.000 .008 .016 .024 .040 .079 .116 .131 .130 .095 TZ-T1.2 0.000 .006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-T1.2 0.000 .006 .014 .022 .033 .067 .117 .140 .149 .129 TZ-T2.2 0.000 .006 .014 .022 .033 .067 .117 .140 .149 .129 TZ-T2.2 0.000 .006 .014 .022 .033 .067 .117 .140 .149 .129 TZ-T2.2 0.000 .006 .014 .022 .033 .067 .117 .140 .149 .129 TZ-T2.2 0.000 .006 .014 .022 .033 .067 .117 .140 .149 .129 TZ-T2.2 0.000 .006 .014 .022 .033 .067 .117 .140 .149 .129 TZ-T2.2 0.000 .006 .014 .022 .033 .067 .117 .140 .149 .129 TZ-T2.2 0.000 .006 .014 .022 .025 .050 .094 .113 .123 .117 TZ-T3.3 0.000 .006 .004 .007 .001 .001 .002 .002 .001 .001 TZ-T3.3 0.000 .000 .001 .002 .003 .005 .009 .009 .009 .001 .001 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .009 .009 .001 .001 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .009 .009 .001 | -3.400 | -4.355 | -5.194 | | | | | | | | TZ 1.2 |
| 0.00C005C11C16024124394742 -1.136 -1.976 TZ 3.1 -2.807 -3.569 -4.249 -4.853 -5.130 -5.390 -5.634 -5.660 -6.064 -6.236 TZ 3.2 0.00C004009013023082296277893 -1.563 TZ-T12.222 -2.835 -3.395 -3.907 -4.147 -4.377 -4.597 -4.8C3 -4.997 -5.165 TZ-T1. 0.00C .00Z .004 .006 .0C2 -0.027175370605 -1.094 TZ 5.1 -1.594 -2.052 -2.494 -2.916 -3.121 -3.323 -3.519 -3.709 -3.888 -4.052 T7 5.2 0.00C .005 .009 .614 .023 .614 -0.009206362707 TZ 6.1 -1.064 -1.418 -1.768 -2.117 -2.292 -2.468 -2.643 -2.814 -2.981 -3.137 TZ 6.2 0.00C .005 .011 .616 .027 .054 .015062 -1.61 .392 TZ 7.1 -644 -909 -1.184 -1.473 -1.622 -1.774 -1.929 -2.082 -2.234 -2.380 T7 7.2 0.00B .615 .024 .039 .060 .047 00.69237 TZ-T1434649 .883 -1.134 -1.267 -1.603 -1.542 -1.683 -1.825 -1.961 TZ-T1. 0.00C .00B .017 .026 .043 .077 .000 .073 .035 -0.071 TZ 8.1 0.00D .00B .016 .024 .039 .060 .047 00.69 -237 TZ-T1. 0.00C .00B .017 .026 .043 .077 .000 .073 .035 -0.071 TZ 8.1 0.00C .00B .016 .024 .041 .073 .109 .113 .097 .033 TZ-TZ. 0.00D .00B .016 .024 .041 .073 .109 .113 .097 .033 TZ-TZ. 0.00C .00B .016 .024 .041 .073 .109 .113 .097 .033 TZ-TZ. 0.00C .00B .016 .024 .041 .073 .109 .113 .097 .033 TZ-TZ. 0.00C .00B .016 .024 .041 .073 .109 .113 .097 .033 TZ-TZ. 0.00C .00B .016 .024 .041 .073 .109 .113 .097 .033 TZ-TZ. 0.00C .00B .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM. 0.00C .00B .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM. 0.00C .00C .014 .02C .033 .007 .117 .140 .149 .129 TZ-TZ. 0.00C .00C .014 .02C .033 .007 .117 .140 .149 .129 TZ-TZ. 0.00C .00C .001 .001 .002 .003 .005 .009 .004 .113 .123 .117 TZ-T3. 0.00C .00C .001 .007 .001 .009 .005 .009 .009 .104 .101 TZ13.1 0.00B .03E .039 .039 .039 .000 .004 .113 .123 .117 TZ-T3. 0.00C .00C .00C .001 .007 .001 .009 .001 .009 .001 .007 .001 .007 .001 .007 .009 .001 .001 .007 .007 .001 .007 .009 .001 .007 .007 .009 .001 .007 .007 .009 .001 .007 .007 .008 .001 .007 .007 .008 .000 .000 .001 .007 .007 .008 .000 .000 .001 .007 .007 .009 .000 .001 .00 | 0.600 | 009 | 019 | 027 | 045 | 137 | 425 | 801 | -1.233 | -2.166 | T7 2.1 |
| -2.807 -3.569 -4.249 -4.853 -5.130 -5.39C -5.634 -5.860 -6.064 -6.236 | -3.092 | -3.942 | -4.695 | -5.3:3 | -5.652 | -5.930 | -6.189 | | | | TZ 2.2 |
| -2.807 -3.569 -4.249 -4.853 -5.130 -5.39C -5.634 -5.860 -6.064 -6.236 | 0.000 | 005 | C11 | 016 | 034 | 124 | 394 | 742 | -1.136 | -1.978 | TZ 3.1 |
| 0.000004009012023082296577893 -1.563 TZ-T1. -2.222 -2.835 -3.355 -3.907 -4.147 -4.377 -4.897 -4.864 -4.997 -5.165 TZ-T1. 0.000 .002 .004 .006 .002027175375605 -1.094 TZ 5.1 -1.594 -2.052 -2.494 -2.916 -3.121 -3.323 -3.519 -3.709 -3.688 -4.052 TZ 5.2 0.000 .005 .009 .014 .023 .014069206362707 TZ 6.1 -1.604 -1.418 -1.768 -2.117 -2.292 -2.468 -2.463 -2.814 -2.981 -3.137 TZ 6.2 0.000 .005 .011 .016 .027 .054 .015062161392 TZ 7.1 444909 -1.184 -1.473 -1.622 -1.774 -1.929 -2.082 -2.234 -2.380 TZ 7.2 0008 .015 .024 .039 .060 .047 .00.69237 TZ-T1. 435644883 -1.134 -1.247 -1.403 -1.542 -1.683 -1.825 -1.961 TZ-T1. 0008 .017 .026 .043 .077 .090 .073 .035071 TZ 8.1 210373562774889 -1.007 -1.130 -1.255 -1.381 -1.506 TZ 8.2 0000 .008 .017 .022 .043 .077 .090 .073 .035071 TZ 8.1 0000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-T2. 0000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-T2. 0000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-T2. 0006 .016 .024 .041 .079 .116 .131 .130 .095 TZ-TM. 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM. 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM. 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM. 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM. 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM. 0006 .016 .027 .033 .047 .177 .140 .149 .129 TZ-T2. 0006 .019 .025 .0269 .036 .047 .099 .104 .113 .123 .117 TZ-T2. 0006 .019 .025 .0269 .038 .007 .017 .177 .128 .177 .177 .073. 0.000 .006 .014 .027 .033 .067 .117 .140 .149 .129 TZ-T2. 0006 .019 .017 .025 .050 .094 .113 .123 .117 TZ-T3. 0007 .008 .007 .011 .019 .038 .007 .099 .104 .101 TZ-T3. 0008 .006 .007 .001 .009 .003 .005 .009 .009 .104 .101 TZ-T3. 0000 .001 .007 .003 .005 .009 .009 .009 .104 .101 TZ-T3. | -2.907 | -3-569 | -4.249 | -4.853 | -5.130 | | | | | | |
| -2.222 -2.83f -3.395 -3.907 -4.147 -4.377 -4.597 -4.865 -4.997 -5.165 TZ-T1.00.000 .002 .004 .006 .002 -0.27 -175 -375 -6.05 -1.094 TZ 5.1 -1.594 -2.052 -2.494 -2.916 -3.121 -3.323 -3.519 -3.709 -3.888 -4.052 TZ 5.2 0.000 .00f .009 .014 .023 .014 -0.069206 -362 -7707 TZ 6.1 -1.064 -1.416 -1.768 -2.117 -2.292 -2.468 -2.643 -2.614 -2.981 -3.137 TZ 6.2 0.000 .005 .011 .016 .027 .054 .015 -0.02 -0.161 -3.92 TZ 7.1 -0.444 -9.09 -1.164 -1.473 -1.622 -1.774 -1.929 -2.082 -2.234 -2.380 TZ 7.1 -0.444 -9.09 -1.164 -1.473 -1.622 -1.774 -1.929 -2.082 -2.234 -2.380 TZ 7.1 -0.434 -0.649 -883 -1.134 -1.227 -1.403 -1.542 -1.683 -1.825 -1.961 TZ-T1.2 0.000 .008 .017 .026 .043 .077 .090 .073 .035 -0.071 TZ 8.1 -2.10 -3.73 -5.62 -7.74 -8.89 -1.007 -1.130 -1.255 -1.381 -1.500 TZ 8.2 0.000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TZ.1 0.000 .006 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TZ.1 0.000 .006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TH.1 0.27 -0.69 -1.90 -3.33 -413 -4.96 -1.62 -7.63 -8.55 TZ-TM.2 0.000 .006 .014 .026 .023 .067 .117 .140 .149 .129 TZ-TZ.2 0.000 .006 .014 .026 .023 .067 .117 .140 .149 .129 TZ-TZ.2 0.000 .006 .014 .026 .023 .067 .117 .140 .149 .129 TZ-TZ.2 0.000 .006 .017 .026 .023 .067 .117 .140 .149 .129 TZ-TZ.2 0.000 .006 .014 .026 .023 .067 .117 .140 .149 .129 TZ-TZ.2 0.000 .006 .014 .026 .023 .067 .117 .140 .149 .129 TZ-TZ.3 0.000 .006 .017 .025 .0269 .038 .040 .029 .031 .017 TZ-T3.3 0.000 .006 .007 .011 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.008 .038 -0.039 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.006 .006 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 0.008 .034 -0.039 .005 .009 .009 .009 .001 .001 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .001 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .001 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .001 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .001 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .001 TZ-T4.3 0.000 .001 .002 .003 .005 | | | | | - | | | | | | |
| 0.000 | | | | | | | | | | | |
| -1.594 -2.052 -2.494 -2.916 -3.121 -3.323 -3.519 -3.709 -3.688 -4.052 T7 5.2 0.00C .005 .009 .614 .623 .614 -069 -206 -362 -707 TZ 6.1 -1.064 -1.416 -1.768 -2.117 -2.292 -2.468 -2.643 -2.814 -2.981 -3.137 TZ 6.2 0.000 .005 .011 .616 .027 .054 .015062161 -3.92 TZ 7.1644909 -1.184 -1.473 -1.622 -1.774 -1.929 -2.082 -2.234 -2.380 T7 7.2 0008 .615 .024 .039 .060 .047 0069237 TZ-T1.1434645883 -1.134 -1.227 -1.403 -1.542 -1.683 -1.825 -1.961 TZ-T1.2 0008 .017 .026 .043 .077 .090 .073 .035071 TZ 8.1210373662774889 -1.007 -1.30 -1.255 -1.381 -1.506 TZ 8.2 0.600 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-T2.3665 -1.92344522619721826935 -1.045 -1.155 TZ-T2.3 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM.2 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM.2 0.000 .006 .014 .026 .633 .067 .117 .140 .149 .129 TZ-TZ.3 0.000 .006 .014 .026 .633 .067 .117 .140 .149 .129 TZ-TZ.3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ.3 0.000 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.98 .038039 .132 -185240298398417479 TZ11.2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.3 0.000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 0.74 .034020083116150183218252285 TZ13.2 0.000 .001 .007 .001 .015 .025 .000 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .007 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 | | | | | | | | | | | |
| 0.00C .00f .007 .014 .023 .014069206362707 TZ 6.1 -1.064 -1.416 -1.768 -2.117 -2.292 -2.468 -2.643 -2.614 -2.981 -3.137 TZ 6.2 0.000 .005 .011 .016 .027 .054 .015062 .0161 .392 TZ 7.1644909 -1.184 -1.473 -1.622 -1.774 -1.929 -2.082 -2.234 -2.380 TZ 7.2 0008 .015 .024 .039 .060 .047 0069 .237 TZ-T1.1434644883 -1.134 -1.227 -1.403 -1.542 -1.683 -1.825 -1.961 TZ-T1.2 0.000 .008 .017 .026 .043 .077 .090 .073 .035071 TZ 8.1210373562774889 -1.007 -1.13C -1.255 -1.381 -1.506 TZ 8.2 0.000 .008 .016 .024 .041 .079 .109 .113 .097 .033 TZ-TZ.1665192344222619721826935 -1.045 -1.155 TZ-TZ.2 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM.2 0.000 .006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM.2 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ.2 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ.2 0.000 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.098 .036039132185269336466479553626 TZ-TZ.2 0.000 .006 .001 .015 .025 .050 .094 .113 .123 .117 TZ-T3.2 0.006 .004 .007 .011 .019 .038 .070 .098 .104 .034 .389 TZ-TZ.3 0.000 .004 .004 .007 .011 .019 .038 .070 .098 .104 .011 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 | | | | | | | | | | | |
| -1.064 -1.416 -1.768 -2.117 -2.292 -2.468 -2.643 -2.614 -2.981 -3.137 TZ 6.2 0.000 .005 .011 .016 .027 .054 .015062161392 TZ 7.1644909 -1.164 -1.473 -1.622 -1.774 -1.623 -2.082 -2.234 -2.380 TZ 7.2 0008 .015 .024 .039 .060 .047 0069237 TZ-T1.1434645883 -1.134 -1.267 -1.403 -1.542 -1.683 -1.825 -1.961 TZ-T1.2 0.000 .008 .017 .026 .043 .077 .090 .073 .035071 TZ 8.1210373563774889 -1.007 -1.130 -1.255 -1.381 -1.506 TZ 8.2 0.000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TZ.2665192344522619721826935 -1.045 -1.155 TZ-TZ.3 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM-3 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM-3 0.027065 -190333413496721826935 -1.045 -1.155 TZ-TZ-3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-3 0.000 .006 .014 .027 .038 .064 .102 .125 .137 .131 TZ11.1 0 .006 .038039139185240298358417479 TZ11.2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.3 0.006 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 0.074 .034020083116150183218252285 TZ13.2 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.2 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.2 | | | | | .023 | | | | | | - |
| 0.000 .005 .011 .c16 .027 .054 .015062161392 TZ 7.1644909 -1.164 -1.473 -1.622 -1.774 -1.629 -2.072 -2.234 -2.380 TZ 7.2 0008 .c15 .024 .039 .060 .047 .0069237 TZ-T1.1 434645883 -1.134 -1.267 -1.403 -1.542 -1.663 -1.825 -1.961 TZ-T1.2 0006 .017 .026 .043 .077 .090 .073 .035071 TZ 8.1 210373562774889 -1.007 -1.13c -1.255 -1.381 -1.506 TZ 8.2 0006 .016 .024 .041 .075 .109 .113 .097 .033 TZ-T2.1 665192344522619721826935 -1.045 -1.155 TZ-T2.3 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM.1 0.27065 -190333413496721826935 -1.045 -1.155 TZ-T2.3 0006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-T2.3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-T2.3 0.079 .006691265269336466 .466 .469553626 TZ-T2.3 0.098 .038039132185240298358417479 TZ11.2 0005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.3 0.98 .046023097137179223269314389 TZ-T3.3 0.000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 0.74 .034020083116150103218 .252285 TZ13.2 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .000 | | | | | | | | | | | |
| 644909 -1-184 -1-473 -1-622 -1-774 -1-929 -2-082 -2-234 -2-380 | | | | | | | | | | | |
| 0. 008 c15 c024 c039 c060 c047 0c069 -c237 TZ-T1-1434 -c649 c883 -1-134 -1-267 -1-403 -1-542 -1-683 -1-825 -1-961 TZ-T1-2 0.000 c008 c017 c026 c043 c077 c090 c073 c035 -c071 TZ 8-1210 -c373 -c562 c774 c889 -1-007 -1-130 -1-255 -1-381 -1-506 TZ 8-2 0.000 c008 c016 c24 c041 c075 c109 c113 c097 c033 TZ-TZ-1665 c192 c344 c522 c-619 c721 c826 c-935 -1-045 -1-155 TZ-TZ-1 0. c006 c016 c24 c040 c079 c116 c131 c130 c095 TZ-TM-1 0. c006 c016 c24 c040 c079 c116 c131 c130 c095 TZ-TM-1 0. c006 c016 c24 c040 c079 c116 c131 c130 c095 TZ-TM-1 0. c000 c006 c014 c026 c033 c067 c117 c140 c149 c129 TZ-TZ-1 0. c090 c006 c014 c026 c033 c067 c117 c140 c149 c129 TZ-TZ-1 0. c090 c006 c013 c019 c032 c064 c102 c125 c137 c131 TZ11-1 0. c098 c038 cc69 c132 c-185 c-240 c-298 c-358 c-417 c-479 TZ11-2 0 c006 c010 c015 c025 c050 c044 c113 c123 c117 TZ-T3-1 0. c098 c046 c-023 c067 c119 c225 c269 c314 c389 TZ-T3-1 0. c098 c046 c023 c067 c094 c113 c123 c117 TZ-T3-1 0. c098 c046 c023 c069 c094 c113 c123 c117 TZ-T3-1 0. c098 c046 c023 c069 c099 c019 c020 c021 c011 TZ-T3-1 0. c000 c001 c002 c003 c005 c009 c019 c020 c021 c011 TZ-T3-1 0. c000 c001 c002 c003 c005 c009 c019 c020 c021 c011 TZ-T3-1 0. c000 c001 c002 c003 c005 c009 c019 c020 c021 c011 TZ-T3-1 | | | | - | | | | | | | |
| 434649883 -1-134 -1-267 -1-403 -1-542 -1-683 -1-825 -1-961 TZ-T1-2 0.000 -008 -017 -026 -043 -077 -090 -073 -035071 TZ 8-1 210373562774889 -1-007 -1-130 -1-255 -1-381 -1-506 TZ 8-2 0.000 -008 -016 -024 -041 -075 -109 -113 -097 -033 TZ-T2-1 665192344522619721826935 -1-045 -1-155 TZ-TZ-1 0006 -016 -024 -040 -079 -116 -131 -130 -095 TZ-TM-1 0006 -016 -024 -040 -079 -116 -131 -130 -095 TZ-TM-2 0.000 -006 -014 -026 -033 -0413496F83692763855 TZ-TM-2 0.000 -006 -014 -026 -033 -067 -117 -140 -149 -129 TZ-TZ-1 0.000 -006 -001 -265 -269 -336466479553626 TZ-TZ-2 0.000 -006 -013 -019 -032 -064 -102 -125 -137 -131 TZ11-1 0.098 -038039132185240298358417479 TZ11-2 0 -065 -010 -015 -025 -050 -094 -113 -123 -117 TZ-T3-1 0.098 -040623697137 -179223269314389 TZ-T3-2 0.000 -004 -007 -011 -019 -038 -070 -098 -104 -101 TZ13-1 0.074 -034020083116150183218252285 TZ13-2 0.000 -001 -002 -003 -005 -009 -019 -020 -021 -011 TZ-T3-1 0.000 -001 -002 -003 -005 -009 -019 -020 -021 -011 TZ-T3-1 0.000 -001 -002 -003 -005 -009 -019 -020 -021 -011 TZ-T4-1 | | | - | | _ | | | | | | |
| 0.000 .008 .017 .026 .043 .077 .090 .073 .035 -071 TZ 8.1 -210 -373 -562 -774 -6889 -1.007 -1.130 -1.255 -1.381 -1.506 TZ 8.2 0.000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TZ.1 -665 -1.92 -344 -522 -619 -721 -826 -935 -1.045 -1.155 TZ-TZ.2 0.000 .006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM.3 0.027 -0.065 -1.90 -333 -413 -696 -F83 -692 -763 -855 TZ-TM.3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ.3 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ.3 0.079 .006 -691 -205 -269 -336 -466 -479 -553 -626 TZ-TZ.3 0.000 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.098 .038 -0.039 -132 -185 -240 -298 -358 -417 -479 TZ11.2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.3 0.058 .046 -0.023 -0.05 .050 .094 .113 .123 .117 TZ-T3.3 0.058 .046 .023 -0.079 .038 .036 -0.039 -1.137 -1.179 -2.23 -2.69 -314 -3.79 TZ-T3.3 0.000 .004 .007 .001 .001 .009 .038 .070 .098 .104 .101 TZ13.1 0.074 .034 -0.020 -0.083 -116 -150 -183 -218 -2252 -285 TZ13.2 0.000 .001 .007 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 0.000 .001 .007 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 0.000 .000 .001 .002 .003 .005 .009 .0019 .020 .021 .0011 TZ-T4.3 0.000 .000 .001 .002 .003 .005 .009 .0019 .020 .021 .0011 TZ-T4.3 0.000 .000 .001 .002 .003 .005 .009 .0019 .020 .021 .0011 TZ-T4.3 0.000 .0000 .001 .002 .003 .005 .009 .0019 .020 .021 .0011 TZ-T4.3 0.0000 .0000 .001 .002 .003 .005 .009 .0019 .020 .021 .0011 TZ-T4.3 0.0000 .0000 .001 .0002 .0003 .005 .0009 .0019 .020 .021 .0011 TZ-T4.3 0.0000 .0000 .001 .0002 .0003 .0005 .0009 .0019 .020 .021 .0011 TZ-T4.3 0.0000 .0000 .0001 .0002 .0003 .0005 .0009 .0019 .020 .021 .0011 TZ-T4.3 0.0000 .0000 .0001 .0002 .0003 .0005 .0009 .0019 .0020 .0021 .0011 TZ-T4.3 0.0000 .000000 .0001 .0002 .0003 .0005 .0009 .0019 .0020 .0021 .0011 TZ-T4.3 0.0000 .0000 .00000 .0001 .0002 .0003 .0005 .0009 .0009 .0009 . | | | | | | | •047 | 0. | | | |
| 210373562774689 -1.007 -1.13C -1.255 -1.381 -1.506 TZ 8.2 0.000 .008 .016 .024 .041 .079 .109 .113 .097 .033 TZ-TZ-1665192344522619721826935 -1.045 -1.155 TZ-TZ-1 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TH-1 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TH-1 0.027069190333413496583692763855 TZ-TH-1 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-1 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-1 0.000 .006691205269336406479553626 TZ-TZ-2 0.000 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11-1 0.098 .038039132185240298358417479 TZ11-2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3-1 0.036 .04C023097137179225269314359 TZ-T3-2 0.000 .004 .007 .001 .0019 .038 .070 .098 .104 .101 TZ13-1 0.74 .034020083116150183218252285 TZ13-2 0.000 .001 .007 .003 .005 .009 .019 .020 .021 .011 TZ-T4-1 0 .000 .001 .007 .003 .005 .009 .019 .020 .021 .011 TZ-T4-1 | | | | | | | | | | | TZ-T1.2 |
| 0.000 .008 .016 .024 .041 .075 .109 .113 .097 .033 TZ-TZ-12.5665192344522619721826935 -1.045 -1.155 TZ-TZ-12.5 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM-12.5 0.027069190333413496863692763855 TZ-TM-12.5 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-12.5 0.079 .006691265269336466479553626 TZ-TZ-12.5 0.000 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.098 .038039132185240298358417479 TZ11.2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.1 0.098 .046023097137179225269314359 TZ-T3.6 0.000 .004 .007 .001 .019 .038 .070 .098 .104 .101 TZ13.1 0.74 .034020083116150183218252285 TZ13.2 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.5 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.5 | | | | | | | | | | | |
| 665192344222619721826935 -1.045 -1.155 TZ-TZ.50 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM.10 .027069190333413496E83692763855 TZ-TM.20 .000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ.50 .079 .006691265269336466479553626 TZ-TZ.20 .079 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 .098 .038039132185240298358417479 TZ11.2 .0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.2 .139 .064 .007 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.2 .139 .000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 .074 .034020083116150183218252285 TZ13.2 .000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.2 .000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.2 .000 .000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.5 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.5 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.5 .0000 .000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.5 .0000 .000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.5 .0000 .000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.5 .0000 .000 .001 .002 .003 .005 .009 .019 .020 .021 .0011 TZ-T4.5 .0000 .0000 .001 .002 .003 .005 .009 .009 .009 .001 .001 .001 .001 .002 .003 .005 .009 .009 .001 .002 .001 .001 .002 .003 .005 .009 .009 .001 .002 .001 .001 .002 .003 .005 .009 .009 .001 .002 .001 .001 .002 .003 .005 .009 .009 .009 .001 .001 .001 .002 .003 .005 .009 .009 .009 .001 .001 .001 .001 .002 .003 .005 .009 .009 .009 .001 .001 .001 .001 .002 .003 .005 .009 .009 .009 .001 .001 .001 .001 .002 .003 .005 .009 .009 .009 .001 .001 .001 .001 .002 .003 .005 .009 .009 .009 .001 .001 .001 .001 .002 .003 .005 .009 .009 .009 .001 .001 .001 .001 .002 .003 .005 .009 .009 .009 .009 .001 .001 .001 .001 | | | | | | | | | | | - |
| 0006 .016 .024 .040 .079 .116 .131 .130 .095 TZ-TM.1 .027069190333413496E83692763855 TZ-TM.2 .000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-1 .079 .006691265269336466479553626 TZ-TZ-2 .000 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 .098 .038039132185240298358417479 TZ11.2 .0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.1 .098 .046623097137179225269314359 TZ-T3.2 .000 .004 .007 .001 .009 .038 .070 .098 .104 .101 TZ13.1 .074 .034020083116150183218252285 TZ13.2 .000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 .000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.3 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .0011 TZ-T4.3 .0000 .001 .002 .003 .005 .009 .009 .009 .020 .021 .0011 TZ-T4.3 .0000 .001 .002 .003 .005 .009 .009 .009 .0021 .0011 TZ-T4.3 .0000 .001 .002 .003 .005 .009 .009 .0019 .020 .021 .0011 TZ-T4.3 .0000 .0000 .001 .002 .003 .005 .009 .009 .0019 .020 .021 .0011 TZ-T4.3 .0000 .0000 .001 .002 .003 .005 .009 .009 .0019 .020 .021 .0011 TZ-T4.3 .0000 .0000 .001 .002 .003 .005 .009 .009 .0019 .0020 .0011 .0011 TZ-T4.3 .0000 .0000 .0000 .001 .002 .003 .005 .009 .009 .0019 .0020 .0011 .0011 .0020 .0020 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010 .0020 .0010 .0010000000000 | 0.000 | •008 | •016 | •024 | -041 | -075 | | | | | TZ-T2.1 |
| .027069190333413696763692763855 TZ-TM.6 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-1 0.079 .006691265269336466479553626 TZ-TZ-2 0.006 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.098 .038039132185240298358417479 TZ11.2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.1 0.098 .046623697137179225269314359 TZ-T3.2 0.000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 0.74 .034020083116150183218252285 TZ13.2 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.1 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.2 | 665 | 192 | 344 | :22 | 619 | 721 | 826 | 935 | -1.045 | -1.155 | TZ-T2.2 |
| .027069190333413696763692763855 TZ-TM.6 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-1 0.079 .006691265269336466479553626 TZ-TZ-2 0.006 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.098 .038039132185240298358417479 TZ11.2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.1 0.098 .046623697137179225269314359 TZ-T3.2 0.000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 0.74 .034020083116150183218252285 TZ13.2 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.1 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.2 | 0. | .008 | •016 | .024 | ·040 | .079 | .116 | •131 | •130 | •095 | TZ-TM.1 |
| 0.000 .006 .014 .026 .033 .067 .117 .140 .149 .129 TZ-TZ-Z- .079 .006691265269336466479553626 TZ-TZ-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z | | | | | 413 | 696 | Te3 | | | | TZ-TM.2 |
| 0.079 | | | | | .033 | .067 | .117 | | | | |
| 0.000 .006 .013 .019 .032 .064 .102 .125 .137 .131 TZ11.1 0.098 .038039132185240298358417479 TZ11.2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.3 0.098 .04CC23C97137179223269314389 TZ-T3.3 0.000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 0.74 .034020083116150183218252285 TZ13.2 0.000 .001 .007 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 | | | | | 269 | 336 | | | | | |
| .098 .038039132185240298358417479 TZ11.2 0 .005 .010 .015 .025 .050 .094 .113 .123 .117 TZ-T3.3 .098 .04CC23C97137179225269314379 TZ-T3.3 0.000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 0.74 .034020083116150183218252285 TZ13.2 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.3 | | | | | | | | | | | |
| 0 | | | | 132 | 1 DK | 260 | | | | | |
| .098 .04CC23C97137179223269314359 TZ-T3.6 0.000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 .074 .034020083116150183218252285 TZ13.2 0.000 .001 .007 .003 .005 .009 .019 .020 .021 .011 TZ-T3.1010036C65097113129144158173188 TZ-T3.6 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.5 | | | | | " UOR | | | | | | |
| 0.000 .004 .007 .011 .019 .038 .070 .098 .104 .101 TZ13.1 .074 .034020083116150183218252285 TZ13.2 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T3.1 .010036665097113129144158173188 TZ-T3.2 .0000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.1 | | | | | _ 127 | | 335 | | | | |
| •074 •034 -•020 -•083 -•116 -•150 -•183 -•218 -•252 -•285 TZ13.2 0.000 •001 •007 •003 •005 •009 •019 •020 •021 •011 TZ-T3.2 -•010 -•036 -•66 -•097 -•113 -•129 -•144 -•158 -•173 -•188 TZ-T3.2 0.000 •001 •002 •003 •005 •009 •019 •020 •021 •011 TZ-T4.1 | | | | (-4 / | | | •623 | | | | |
| 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 T7-T3.1 010036665097113129144158173188 TZ-T3.2 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.1 | | | | 011 | 011 | •U3M | 0070 | | | | |
| 01003606007113129144156173186 TZ-T3.7 0.000 .001 .002 .003 .005 .009 .019 .020 .021 .011 TZ-T4.1 | | | | | | _=• 120 | 103 | | | | |
| 0.000 .001 .002 <u>.0</u> 03 .0 <u>05 .009 .019</u> .020 .021 .011 TZ-T4.1 | | | - 002 | | | •003 | | | | | |
| | | | | 097 | _ <u>-</u> .113 | 323 | 144 | 158 | | | |
| 010036065097113129144158173188 TZ-T4-2 | | | | | | | | | | - | TZ-T4.1 |
| | 010 | 036 | 065 | 097 | 113 | 129 | <u></u> 144 | 158 | 173 | 188 | TZ-T4.2 |

Table I. - Concluded.

```
0.000 -.002 -.003 -.004 -.008 -.015 -.027 -.033 -.039 -.053 -.069 -.069 -.083 -.100 -.116 -.122 -.129 -.134 -.138 -.144 -.148 0.000 -.001 -.004 -.005 -.009 -.018 -.037 -.053 -.062 -.079 -.074 -.108 -.114 -.120 -.118 -.116 -.116 -.114 -.112 -.110 0.000 -.001 -.002 -.002 -.005 -.010 -.018 -.028 -.037 -.055 -.066 -.075 -.078 -.079 -.079 -.079 -.078 -.078 -.078 -.078 0. 242 .339 .413 .521 .726 .996 1.181 1.318 1.490 0. 242 .339 .413 .521 .726 .996 1.181 1.318 1.490
                                                                                                         T716.1
                                                                                                         T716.2
                                                                                                         TZ17.1
                                                                                                        TZ17.2
                                                                                                         TZ-T4.1
                                                                                                         TZ-T4-2
                                                                                                         WORDI.1
                                                                                                         WCRD1.2
        .242 .339 .413 .521 .726 .996 1.181 1.318 1.490 1.543 1.543 1.213 1.021 .819 .615 .413 .212 0. .242 .339 .413 .521 .726 .996 1.181 1.318 1.490 1.543 1.543 1.213 1.021 .819 .615 .413 .212 0.
                                                                                                         WORD2.1
                                                                                                         WORDZ.2
             .-3 1.543
.237
                                                                                                         WDRD3.1
1.543
                                                                                                         WPRD3.2
                                 .406 .514 .713 .979 1.159 1.294 1.463 1.193 1.004 .807 .607 .405 .208 0.000 .386 .49C .679 .931 1.103 1.232 1.392 1.122 .953 .765 .576 .385 .197 0.000 .370 .470 .651 .894 1.059 1.182 1.336
   C.000
                        •333
                                                                                                        WORDT1-1
             1.514
                       1.514
   1.514
                                                                                                         WORDT1-1
              -225
   0.000
                        •316
                                                                                                         WDP 05 . 1
   1.441
             1.441
                       1.437
                                                                                                         WORD5.2
   0.000
               .216
                        •304
                                                                                                         WORD6.1
                                 1.056
   1.383
             1.383
                       1.341
                                             .889
                                                       .714 _ .537
                                                                                      .194
                                                                           .360
                                                                                              0.000
                                                                                                         WORD6.2
                         .294
                                             .455
   0.000
               . 2C8
                                   .35A
                                                                                              1.293
                                                       •631 •866
                                                                          1.025
                                                                                    1.144
                                                                                                         WORD7.1
                                            .848
             1.338
                       1.277
                                 1.006
                                                       .681
   1.338
                                                                 .512
                                                                                     •175
                                                                           .343
                                                                                              0.00C
                                                                                                         WORD7.2
                                ,352
                                                      _.621
                                                                 .852
       0.
               . 205
                         .289
                                             .449
                                                                          1.009
                                                                                    1.126
                                                                                              1.273
                                                                                                         WDRDT1-2
                       1.239
                                   .976
                                                              .497
   1.317
             1.317
                                             .823
                                                       •661
                                                                            .333
                                                                                      .170
                                                                                                 0.
                                                                                                         WORDT1-2
   0.000
              .2CO
                        .283
                                   .344
                                             .438
                                                       .607
                                                                 .833
                                                                            .987
                                                                                    1.101
                                                                                              1.244
                                                                                                         WDRD8.1
   1.297
                                             .788
             1.287
                       1.186
                                   .935
                                                                  .476
                                                       .633
                                                                            .319
                                                                                     •163
                                                                                              0.000
                                                                                                         WORD8.2
                        .281
   0.000
               .198
                                   .342
                                             .436
                                                       .603
                                                                  .828
                                                                            .981
                                                                                    1.094
                                                                                              1.236
                                                                                                         WORDT2-1
                                                                 .468
   1.279
             1.279
                       1.147
                                   .92C
                                             .775
                                                                            .314
                                                       .622
                                                                                      .160
                                                                                              0.000
                                                                                                         WORDT2-1
                         .288
   6.000
              . 204
                                   •35C
                                             •445
                                                       •616
                                                                 .846
                                                                          1.002
                                                                                    1.119
                                                                                              1.264
                                                                                                         WORDT2-2
   1.339
             1.30€
                       1.154
                                   -910
                                              .766
                                                       .616
                                                                  .463
                                                                            .310
                                                                                                        WORDT2-2
                                                                                      .157
                                                                                              0.000
                                                       .606
       C.
               . 20C
                         .282
                                   .343
                                             •438
                                                                  .832
                                                                            .985
                                                                                    1.099
                                                                                              1.242
                                                                                                         MOPDIM
                                  .910
             1.286
                       1.154
                                             .766
                                                                 .463
   1.286
                                                       .616
                                                                            .310
                                                                                      .157
                                                                                              0.000
                                                                                                         WORDTH
                        -295
                                   .359
                                             .457
                                                       .632
                                                                 .868
   0.000
               .209
                                                                          1.028
                                                                                    1.148
                                                                                              1.297
                                                                                                         WORD11.1
                                                                 .467
                                                                           .313
   1.342
             1.342
                       1.164
                                   .917
                                             .773
                                                       .621
                                                                                      .160
                                                                                                        WORD11.2
                                                                                              G.000
                                          •471
                                                     .653
               .217
                        .305
                                   .371
   0.000
                                                                 .897
                                                                          1.062
                                                                                    1.184
                                                                                              1.330
                                                                                                         WORDT3-1
                                   .948
                                            .798
                       1.201
                                                       .641
                                                                 .482
             1.386
                                                                           .323
                                                                                                        WORDT3-1
   1.386
                                                                                      .164
                                                                                              0.000
                                           •484
               .222
                                                                 .920
   C.000
                                   .381
                                                       .670
                                                                          1.090
                         •313
                                                                                    1.216
                                                                                              1.375
                                                                                                         WOP D13.1
                                                                            .331
             1.423
                       1.234
                                   .972
                                             .819
                                                       .659
                                                                 .495
                                                                                      .159
                                                                                              0.00C
                                                                                                        WURD13.2
   1.423
                                            .510
                                                                                   _1.282
                                                      .706
                                                                 .969
               .235
                         .330
                                   .402
   0.000
                                                                          1.148
                                                                                              1.449
                                                                                                         WORDT3-2
                                                     .692
                                                              .521
                                                                          .349
   1.500
             1.50C
                       1.300
                                  1.024
                                             ~862
                                                                                     .178
                                                                                              0.000
                                                                                                         WORDT3-2
                         .059
                                   830.
              .029
   C. COC
                                             .146
                                                      . 285
                                                                 .541
                                                                            .766
                                                                                      .961
                                                                                              1.261
                                                                                                         WORDT4-1
   1.440
             1.500
                        1.44C
                                 1.261_ 1.126
                                                      ..961___,766
                                                                          . 541 ... .285
                                                                                              0.000
                                                                                                        WORDT4-1
                         .059
               .029
   0.000
                                   -088
                                             .146
                                                      .. 285 .541 .. 765
                                                                                      .961
                                                                                              1.261
                                                                                                         WDRD16.1
   1.440
             1.500
                        1.440
                                  1.261 1.126
                                                    - • °61 __ • 766 _ • 541 _ • 285
                                                                                              0.000
                                                                                                        WGRD16.2
                         •059
                                   .088
                                                       . 285
   0.000
                                                               .541
                                                                            .766
                                                                                     .961
               .029
                                             .146
                                                                                              1.261
                                                                                                         WORD17.1
   1.440
             1.500
                       1.440
                                  1.261
                                           1.126 ___.961
                                                                 .766
                                                                                      .285
                                                                            .541
                                                                                              0.000
                                                                                                         WOP017.2
                        .050
                                   .086
   3.000
              .029
                                                                 .541
                                                                            .766
                                                                                      .961
                                             1.261
                                                                                                         WORDT4-2
   1.440 1.500 1.440
                                 1.261 1.126
                                                      .961
                                                                                      .285 0.000
                                                                 .766
                                                                            .541
                                                                                                         WORDT4-2
0. 3.911 7.921 11.733 15.644 19.555 23.466 27.377 31.287 35.198 39.109 43.020 46.931 50.842 54.753 58.664 62.575 66.486 70.397 74.308
                                                                                                         XFUS 10
                                                                                                        XFUS 20
XFUS 30
78.219 82.130 86.040 86.766
8.390 8.370 8.340 8.280 8.190 8.040 7.835 7.490 7.008 6.492 5.907 5.344 4.770 4.286 3.791 3.369 2.968 2.594 2.232 1.902
                                                                                                         ZFUS 10
                                                                                                         ZFUS 20
1.596 1.314 1.059 1.020

0. 1.086 3.028 5.430 8.305 11.624 14.852 16.366 16.947 16.366

15.173 15.127 15.387 15.754 16.244 16.871 17.620 18.094 18.156 18.354

18.324 18.156 17.437 17.250
1.596 1.314 1.059
                                                                                                         ZFUS 30
AFUS 10
                                                                                                         AFUS 20
                                                                                                         AFUS 30
 79.810 18.000 C.117 13.752 92.8C6 18.000 3.987 1.872

0. 10. 20. 30. 40. 50. 60. 70. 90. 100.

0. .466 .846 1.138 1.345 1.455 1.498 1.390 .641 0.
                                                                                                        V FIN
0.
                                                                                                        XFIN
C.
                                                                                                         FINORD
```

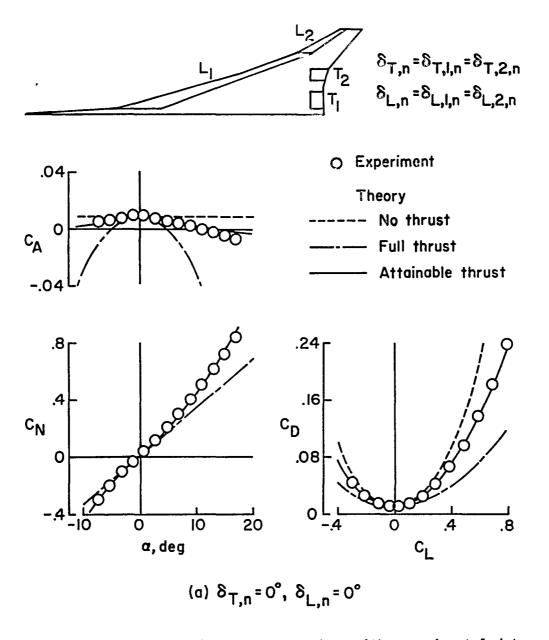


Figure 1. - Correlation of program data with experimental data. M = .28. R = 5.75×10^6

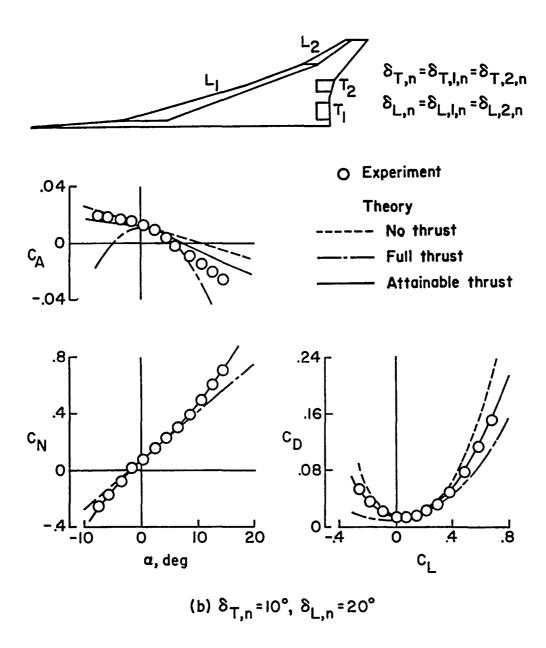


Figure 1. - Continued

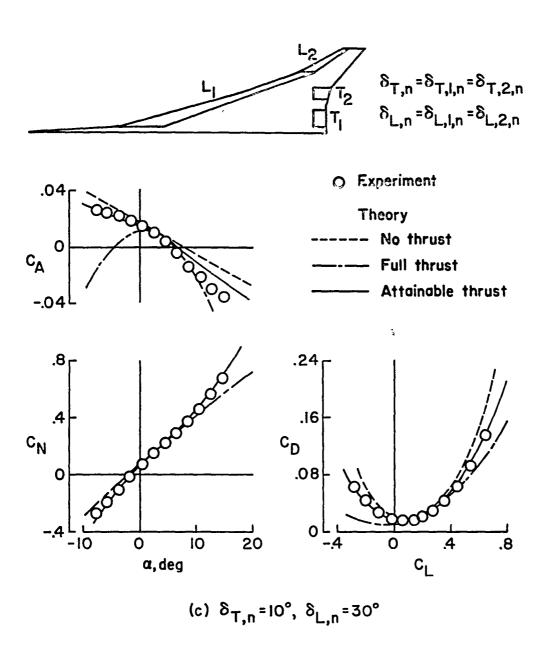


Figure 1. - Continued

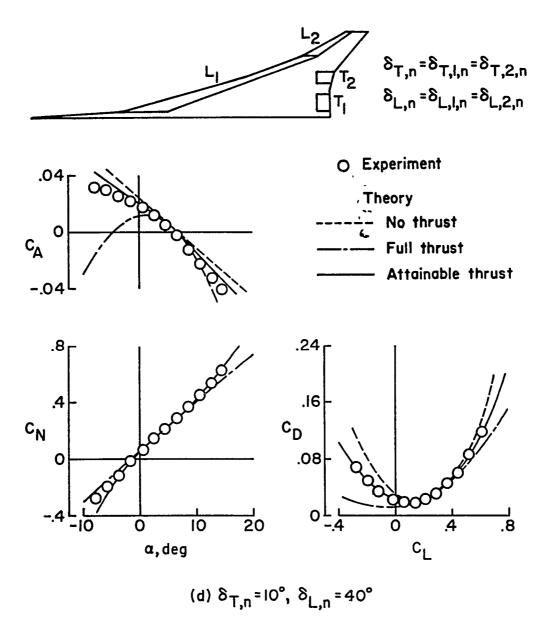


Figure 1. - Continued

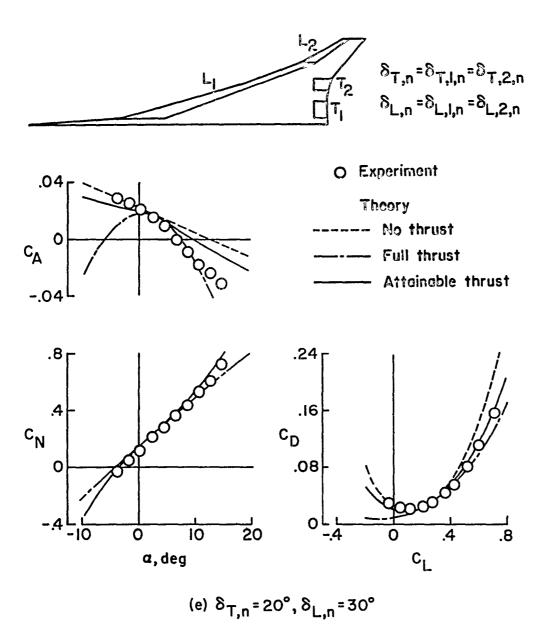


Figure 1. - Continued

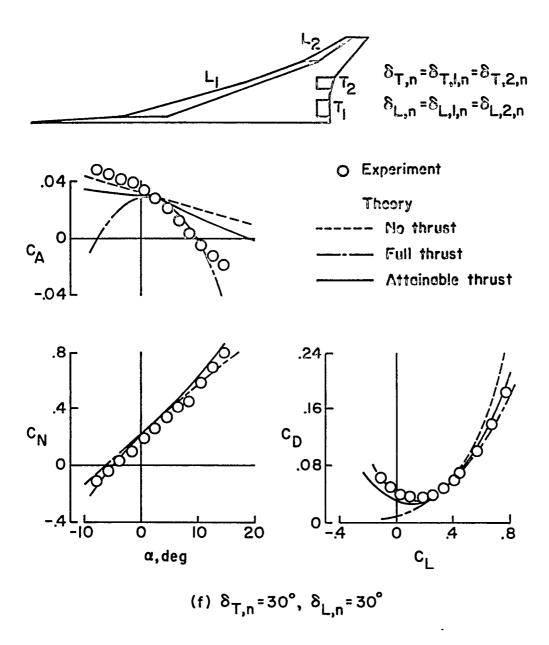


Figure 1. - Continued

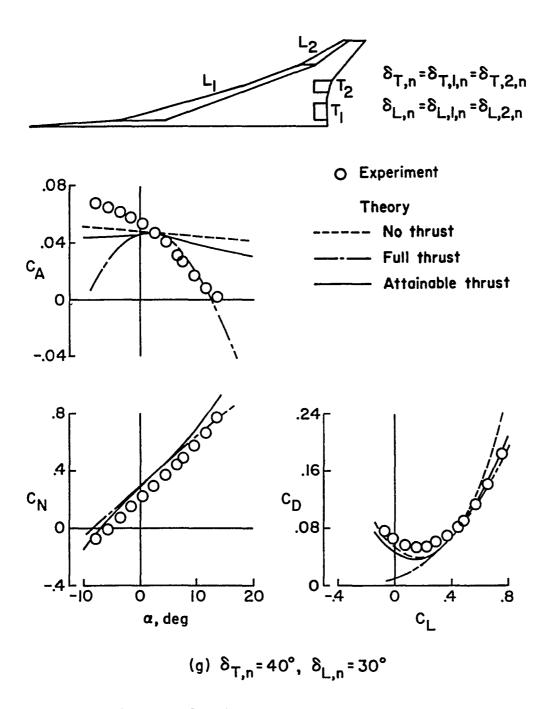


Figure 1. - Concluded

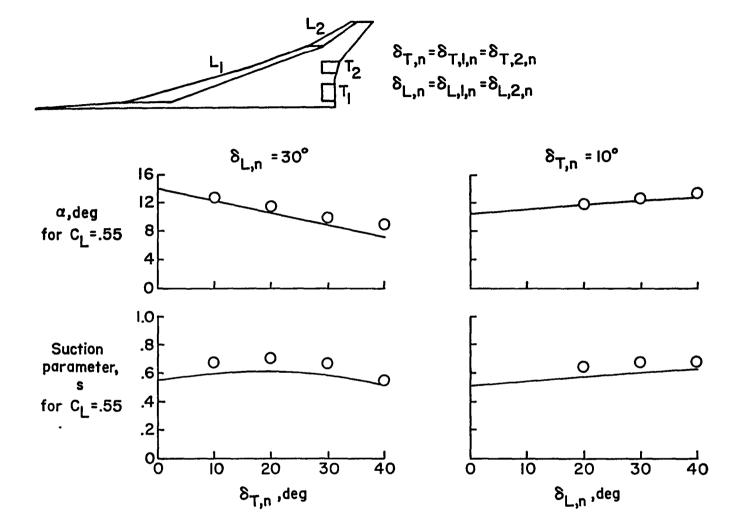
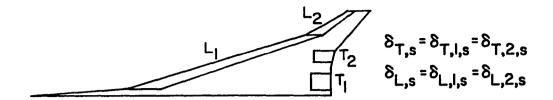


Figure 2. - Comparison of program suction parameters with experimental data. M = .28. R = 5.75×10^6



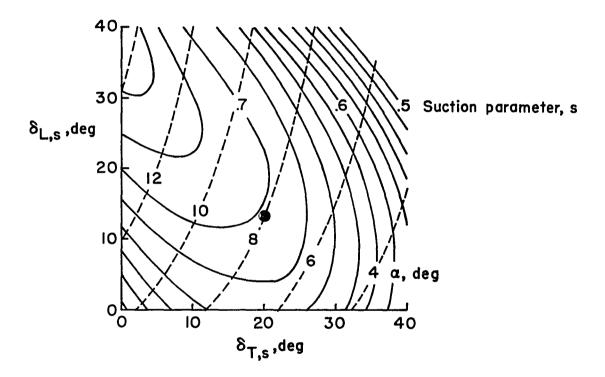


Figure 3. - Suction parameters and angles of attack at ${\rm C_L}$ = .55 for full span leading edge flap system.

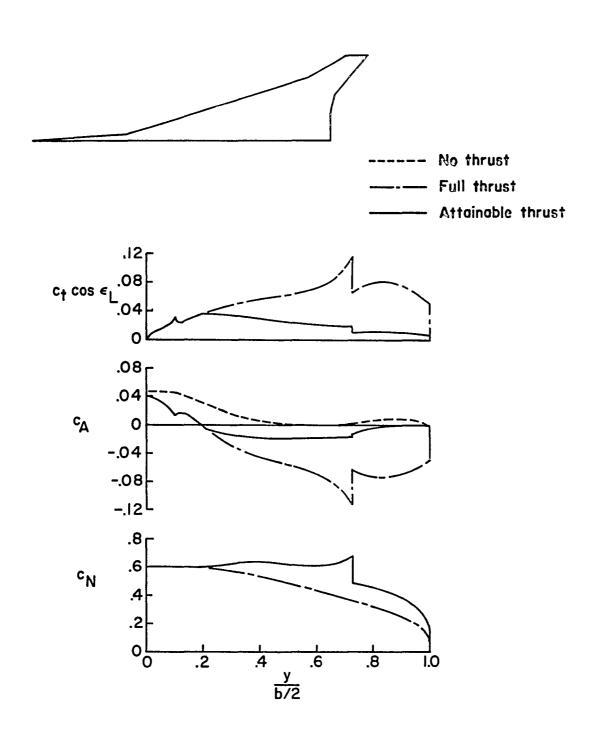


Figure 4. - Spanwise distribution of forces on the basic camber surface at the design lift coefficient. C_L = .55. α = 10.48°.

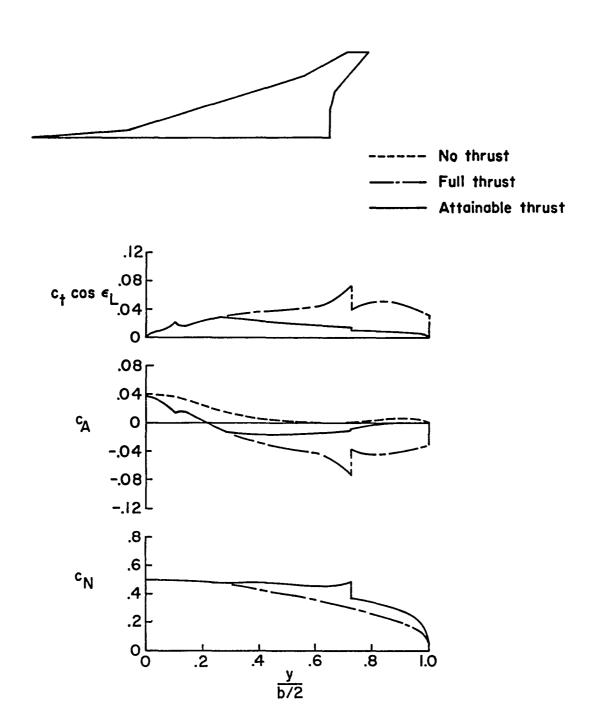


Figure 5. - Spanwise distribution of forces on the basic camber surface at the design angle of attack. α = 8°. C_L = .425.

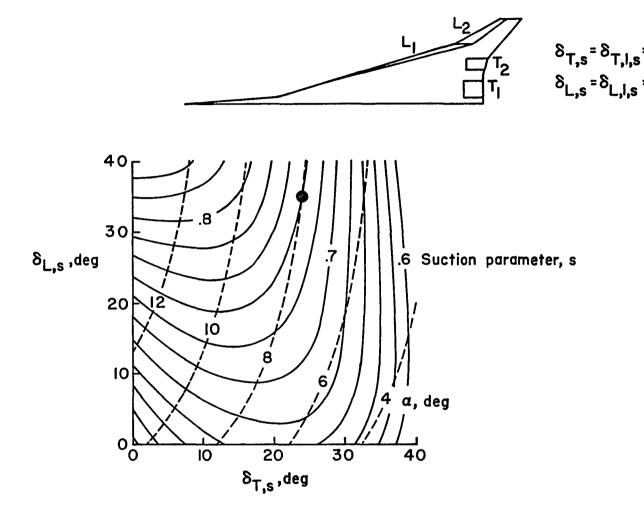


Figure 6. - Suction parameters and angles of attack at C_L = .55 for partial span leading edge flap system.

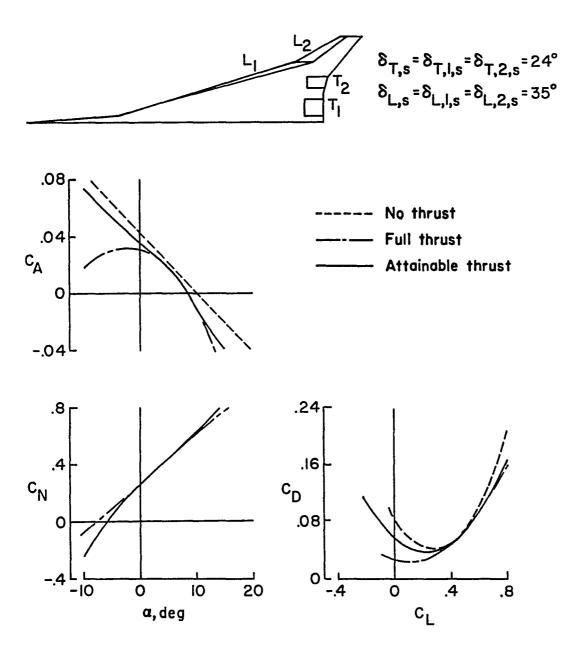
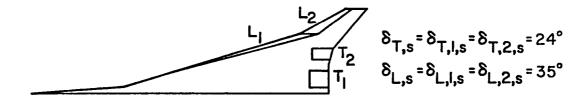


Figure 7. - Program aerodynamic forces for partial span leading edge flaps.



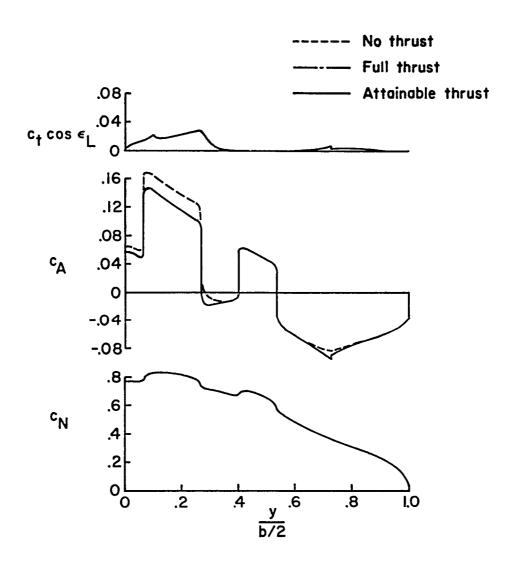
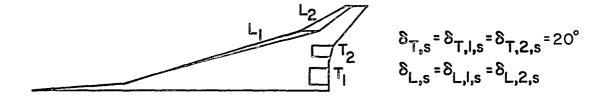


Figure 8. - Spanwise distribution of forces for partial span leading edge flaps at the design condition. C_L = .55. α = 8°.



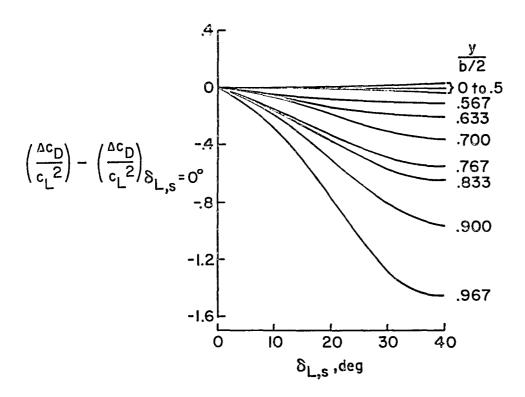


Figure 9. - Variation of section drag-due-to-lift factor with deflection of partial span leading edge flap system, α = $8^{\circ}.$

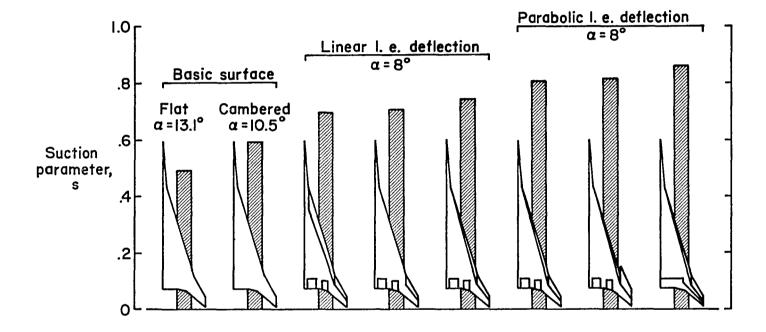


Figure 10. - Summary of suction parameters for the configurations studied. $\rm C_L$ = .55.

| 1 Report No CR-165843 | 2 Government Access | sion No | 3 | Recipient's Catalog No | | | |
|---|--|------------------|---------------------|-----------------------------------|--|--|--|
| 4 Title and Subtitle | ······································ | | 5 | Report Date | | | |
| Application of an Aerodyna | amic Analysis Meth | od Inclu | ding_ | March_1982 | | | |
| Attainable Thrust Estimate | es to Low Speed Le | eading-Edg | ge Flap 6 | Performing Organization Code | | | |
| Design for Supersonic Cru | ise Vehicles | | | | | | |
| 7 Author(s) | | | 8 | Performing Organization Report No | | | |
| Harry W. Carlson | · · · · · · · · · · · · · · · · · · · | | 10 | Work Unit No | | | |
| 9 Performing Organization Name and Addre | 223 | | | | | | |
| NASA Langley Research Cen Hampton, Virginia 23665 | ter | | 11 | Contract or Grant No | | | |
| Hampoon, Inginia 2000 | | | | NAS1-16000 | | | |
| | | | 13 | Type of Report and Period Covered | | | |
| 12 Sponsoring Agency Name and Address | | | | Contractor Report | | | |
| National Aeronautics and Washington, DC 20546 | Space Administrat | ion | 14 | Sponsoring Agency Code | | | |
| 15 Supplementary Notes | | | | | | | |
| Langley Technical Monito | r - Samuel M. Dol | lyhigh | | | | | |
| 16 Abstract | | | | | | | |
| | | | | | | | |
| A study of low speed leading-edge flap design for supersonic cruise vehicles has been conducted. Wings with flaps were analyzed with the aid of a newly developed subsonic wing program which provides estimates of attainable leading-edge thrust. Results indicate that the thrust actually attainable can have a significant influence on the design and that the resultant flaps can be smaller and simpler than those resulting from more conventional approaches. | | | | | | | |
| 17 Key Words (Suggested by Author(s)) | | 18 Distribut | ion Statement | | | | |
| Flap Design Leading-Edge Thrust FEDD Restriction- | | | | | | | |
| Supersonic Cruise Vehicl | UNCLASSIFIED - UNLIMITED | | | | | | |
| Super Sollie Grande Vellier | | STAR CATEGORY 01 | | | | | |
| | | <u> </u> | | | | | |
| 19 Security Classif (of this report) | 20 Security Classif (of this | page) | 21 No of Page 28 | | | | |
| Unclassified | Unclassified | | | A04 | | | |

-

